IN THE CLAIMS:

Please amend the claims as follows:

1. (Amended) A detector arrangement for detection of radiation comprising:

a chamber adapted to be filled with an ionizable and scintillating substance;

a radiation entrance arranged such that radiation can enter said chamber partly for ionizing said ionizable and scintillating substance, partly for being converted into light therein;

a light detection arrangement for temporally, and spatially resolved detection of some of said light;

an electron avalanche detection arrangement for avalanche amplification of electrons released as a result of said ionization of said ionizable and scintillating substance, and for temporally resolved and spatially resolved detection of said avalanche amplified electrons;

a correlator for correlating detected light and detected avalanche amplified electrons, which are derivable from a single radiation photon; and

a signal generator for producing a single signal from said correlated detected light and detected avalanche amplified electrons.

6. (Amended) The detector arrangement as claimed in claim 1 wherein said substance is a scintillating medium.

7. (Amended) The detector arrangement as claimed in claim 6 wherein said scintillating medium is any of Ar, Xe, Kr, or a mixture thereof, and said medium for enhanced avalanche multiplication is CO_2, CH_4, C_2H_6, isobutene, or a mixture thereof.

12. (Amended) The detector arrangement as claimed in claim 1 wherein said light detection arrangement comprises a solid-state based detector for said temporally and spatially resolved detection of said light.

22. (Amended) A method for detection of radiation comprising the steps of:

entering radiation into a chamber filled with an ionizable and scintillating substance partly for ionizing said ionizable and scintillating substance, partly for converting radiation into light therein;

detecting at least some of said light temporally, spatially, and spectrally resolved by means of a light detection arrangement;

avalanche amplifying electrons released as a result of said ionization of said ionizable and scintillating substance, and detecting in two dimensions said avalanche amplified electrons temporally and spatially resolved by means of an electron avalanche detection arrangement;

correlating detected light and detected avalanche amplified electrons, which are derivable from a single radiation photon; and

producing a signal from said correlated detected light and detected avalanche amplified electrons, wherein said signal produced from said correlated detected light and detected avalanche amplified electrons has spatial and temporal resolutions comparable to

the spatial and temporal resolutions of the detected avalanche amplified electrons, and a spectral resolution comparable to the spectral resolution of the detected light.

34. (Amended) A positron emission tomography (PET) method for construction of an image of an object containing positron emitting substance, comprising the steps of:

entering gamma radiation photon pairs emitted in response to said positrons into a chamber filled with an ionizable substance;

avalanche amplifying electrons released as a result of said ionization of said ionizable substance and detecting said electron avalanches temporally and spatially resolved by means of an electron avalanche detection arrangement ;

matching a pair of detected electron avalanches, which are derivable from a single radiation photon pair;

producing a signal from said matched electron avalanche pair;

repeating the step of matching for each further detected electron avalanche;

repeating the step of producing a signal for each further matched electron avalanche pair;

performing a reconstruction process based upon said signals as produced, wherein amounts of emitted positrons from each of an arbitrarily large number of image volumes selected within said object are calculated; and

projecting an image of said amounts of emitted radiation.

38. (Amended) A detector arrangement for detection of radiation comprising a cathode and an anode between which a voltage is applied, said arrangement comprising:

a chamber arranged at least partially between said cathode and said anode, said chamber being filled with an ionizable and scintillating substance;

a radiation entrance arranged such that radiation can enter said chamber between and substantially parallel with said cathode and said anode, partly for being converted into light therein, partly for ionizing said ionizable and scintillating substance, whereby electrons released as a result of said ionization of said ionizable and scintillating substance are drifted substantially perpendicular to the direction of said entered radiation by means of said applied voltage;

a light detection arrangement for temporally and spatially resolved detection of at least some of said light;

an electron avalanche detection arrangement for avalanche amplification of said drifted electrons, and for temporally and spatially resolved detection of said avalanche amplified electrons, said electron avalanche detection arrangement being oriented such that said drifted electrons are accelerated, during avalanche amplification, in a direction substantially perpendicular to the direction of said entered radiation;

correlating means for correlating detected light and detected avalanche amplified electrons, which are derivable from a single radiation photon; and

producing means for producing a single signal from said correlated detected light and detected avalanche amplified electrons.

40. (Amended) The detector arrangement as claimed in claim 52 wherein

said light detection arrangement includes a plurality of individual light detection elements arranged in an array such that each light detection element is capable of

detecting light derivable from absorption by a respective transversely separated portion of said radiation entered into the chamber.

41. (Amended) A method for detection of radiation comprising the steps of:

entering radiation into a chamber filled with an ionizable and scintillating substance partly for ionizing said ionizable and scintillating substance, partly for converting radiation into light therein;

detecting at least some of said light temporally and spatially resolved by means of a light detection arrangement;

drifting electrons released as a result of said ionization of said ionizable and scintillating substance in a direction substantially perpendicular to the direction of said entered radiation by means of applying an electrical field within said chamber;

avalanche amplifying drifted electrons through acceleration of said drifted electrons in a direction substantially perpendicular to the direction of said entered radiation by means of applying an electrical field within said chamber;

detecting said avalanche simplified electrons temporally and spatially resolved by means of an electron avalanche detection arrangement;

correlating detected light and detected avalanche amplified electrons, which are derivable from a single radiation photon; and

producing a signal from said correlated detected light and detected avalanche amplified electrons.

43. (Amended) The method as claimed in claim 42 wherein light derivable from absorption by a respective transversely separated portion of said planar radiation beam is detected separately by means of a plurality of individual light detection elements as comprised in said light detection arrangement.

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Please add the following new claims:

--44. (New) The detector arrangement as claimed in claim 38 wherein said single signal has spatial and temporal resolutions comparable to the spatial and temporal resolutions of the detected avalanche amplified electrons, and a spectral resolution comparable to the spectral resolution of the detected light.

45.(New) The method as claimed in claim 41 wherein said signal produced from said correlated detected light and detected avalanche amplified electrons is produced to have spatial and temporal resolutions comparable to the spatial and temporal resolutions of the detected avalanche amplified electrons, and to have a spectral resolution comparable to the spectral resolution of the detected light.

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46. (New) The detector of claim 1 wherein said light detection arrangement further performs spectrally resolved detection of at least some of said light, said producing means producing a single signal that has spatial and temporal resolutions comparable to the spatial and temporal resolutions of the detected avalanche amplified electrons, and a spectral resolution comparable to the spectral resolution of the detected light.

47. (New) The detector of claim 46 wherein said electron avalanche detection arrangement performs two-dimensional detection of said avalanche amplified electrons.

48. (New) The method of claim 27 wherein said step of avalanche amplifying performs two-dimensional detection of said avalanche amplified electrons.

49. (New) The positron emission tomography (PET) apparatus of claim 30 wherein said electron avalanche detection arrangement includes a matrix of readout elements and temporally resolves and two dimensionally detects said electron avalanches.

50. (New) The positron emission tomography (PET) method of claim 34 wherein said step of avalanche amplifying electrons uses an electron avalanche detection arrangement including a matrix of readout elements and two dimensionally detects said electron avalanches.

51. (New) The detector of claim 38 wherein said light detection arrangement further performs energy resolved detection of at least some of said light,

said radiation entrance is formed to allow said radiation to be a planar radiation beam;

said electron avalanche detection arrangement includes a plurality of readout elements arranged in an array such that each readout element is capable of detecting avalanche amplified electrons derivable from absorption by a respective transversely separated portion of said radiation entered into the chamber; and

said producing means being adapted to produce said single signal depending on the energy of said correlated detected light.

52. (New) The method of claim 43 wherein said entered radiation is a planar radiation beam;

avalanche amplified electrons obtained in said step of avalanche amplifying being derivable from absorption by a respective transversely separated portion of said planar radiation beam detected separately by means of a plurality of readout elements as comprised in said electron avalanche detection arrangement;

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the step of detecting further measuring the energy of said correlated detected light; and said step of producing producing said signal depending on the energy of said correlated detected light.--